No. III.

MACHINE FOR INDICATING THE LEE-WAY OF A SHIP.

The SILVER MEDAL *was presented to Lieut.* HILLS, *R.N., Coast Guard Station, Lancing, for his Lee-way Indicator; a Model of which has been placed in the Society's Repository.*

Coast Guard Station, Lancing,
24th October, 1839.

SIR,

I HAVE to acknowledge the receipt of your letter of the 23d of July last (in reply to one from me), in which you state, "The subject of your communication is one that completely comes within the views of the Society; and, if you send it here addressed to me not later than the end of October, I shall be enabled to place it among the articles that will be laid before the Society at their first meeting, and which will, therefore, obtain the earliest notice of the committees to which they may be referred."

In compliance therewith, I have the honour of forwarding the model of my invention for ascertaining the lee-way, with a description of the same, and its application; also a certificate of its efficiency at the foot thereof, by two experienced naval officers who witnessed a trial of it in a boat.

I am, Sir, &c. &c.

JOHN HILLS, Lieut. R.N.

A. AIKIN, *Esq.*
Society of Arts, &c.

With a side wind a ship is always making lee-way, whether advancing or trying to remain stationary, and when the wind is of a given strength, a ship makes a definite quantity of lee-way in a given time, that quantity increasing with the strength of wind or with the number or surface of sails set; but as that increase will cause the ship to go farther in the same time, the lee-way will be less perceptible in comparison with the distance run.

When a ship leans much from the pressure of the wind, the curvature of the side most immersed tends to turn its head to the wind; and this effect, unless corrected by the manner of placing the sails, or by the rudder, would sometimes more than compensate for lee-way. This, in the absence of a lee-way indicator, has caused some, when so circumstanced, to think that they were sailing without lee-way; whereas, the point to which their ship was really progressing must of necessity have been somewhat to the leeward of its bow; for, with a side wind, it is impossible for a ship to pass through the water in the exact direction of its keel.

Thus, in fig. 3, the line *g g* shews the direction of a ship's keel; the arrows *o o*, the direction of the wind; and the arrows *p p*, the oblique direction in which the ship really passes through the water; and whatsoever deviation that line of passage makes from the direction of the keel, it will be constantly and accurately shewn by this instrument. This indication is, of course, independent of the effect of currents on the ship's course, which can only be seen by means of distant land-marks a-head or a-stern of the vessel.

Description of the Machine and of the Method for fitting the same for service.

In fig. 1, *a b* is a top view, and in fig. 2 a side view of the water-vane, to be made of sheet-copper, 12 inches long (or longer if necessary), breadth 1¼ inch, with the pieces *c d* of the same metal, attached a little sloping, as wings, to ensure its assuming a horizontal position.

e g the spindle, to be of copper, half an inch in diameter, to project two feet below the keel *h* when in use, that the water-vane may be out of the influence of the eddy caused by the ship, to the lower extremity of which the water-vane is attached by the loose joint *g*, to admit of its assuming a horizontal position, but prevented from rising higher by means of the shoulder *l*.

k k a copper tube to enclose the spindle, inside diameter 1½ inch, to be fixed in and through the centre of the keel, the lower edge being rounded off, and even with the lower part of the keel, from whence it is to be brought up the bulkhead between the after-hold and spirit-room (say of a frigate), and when sufficiently above the level of the water, the upper end to be enclosed in a binnacle four feet high, to admit of the spindle being suspended as hereafter-mentioned, and to contain the half, or rather more, of a compass-card *h*, fig. 3, and the tell-tale or index *k;* these are proposed to be placed on the main deck.

In fig. 3, the line *g g* indicates the position of the ship's keel, and *h h* the lee-way card.

The tell-tale *k* is attached to the upper end of the spindle *e*, to traverse over the lee-way card on a smooth metal centre-plate.

At *o*, fig. 2, is placed a fair-leader, or copper ring

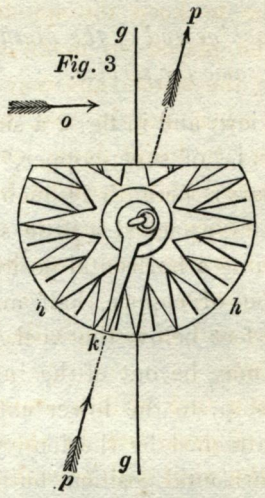


Fig. 3

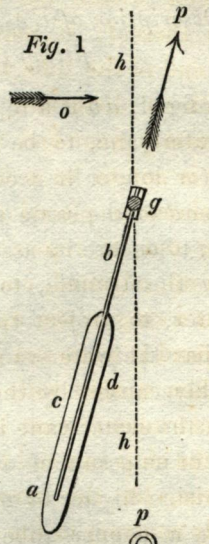


Fig. 1

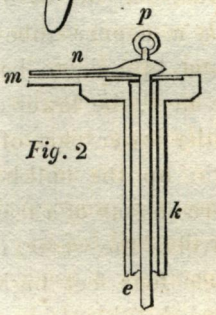


Fig. 2

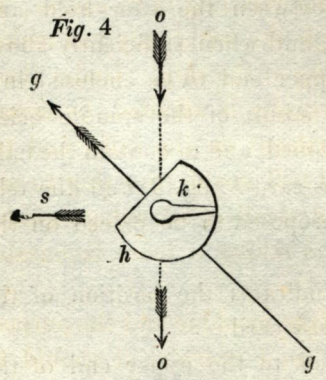
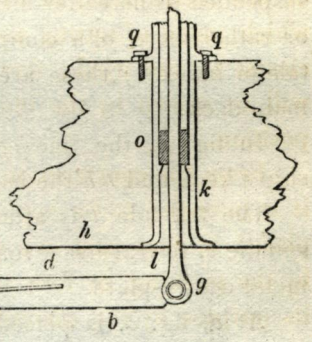


Fig. 4



conductor within the tube to keep the spindle in the centre thereof; it may be placed so much above the lower end of the tube that the water-vane may be drawn up without disturbing it when not in use, to prevent unnecessary wear and tear; or lower down, as the fair-leader is not to be a fixture within the tube, but to rest on a shoulder placed on either side, that in case of its getting out of repair the water-vane may be entirely drawn up, adjusted, and replaced.

p is a ring in the upper end of the spindle, by which to suspend it when not in use.

When a ship sails on a tack with a contrary wind, this instrument must be of great use in shewing how close the ship can sail to the wind with advantage.

Thus, let the arrows *o o*, fig. 4, denote the wind directly contrary to the ship's intended course, the line *g g* the keel, and *h* the lee-way card. Then, if the index *k* stand at right angles to the ship's vane, the ship is evidently only making lee-way in the direction of the arrow *s;* neither advancing nor receding in its course. In this case, the progress through the water only just makes up for the real lee-way driving of the ship. Under these circumstances a good opportunity is afforded, by means of this instrument, to experiment on the sails, and try which mode of setting them will enable the ship to sail closest to the wind; for the smallest advantage gained will be shewn by the index *k* taking a more favourable position.

From the construction of the machine and the purpose it is intended to be applied to, I conceive it should be placed in that part of a ship where the agitation caused by the pitching, or fore and aft motion, does not defeat its purpose by the corresponding violence of motion that

the water-vane would convey to the tell-tale; nor, on the other hand, do I think it necessary that it should be placed directly in the centre of motion; and, therefore, I have named that part of a vessel where, while it would correctly denote the lee-way, it would also be most available for consultation by the officer of the watch, who could, as occasion required, observe it when sailing by the wind, taking care to do so when the ship's head was steadiest to one point, or, in gales of wind, from the lowest point of falling off until she again reached her highest point of coming up; in either case, the mean of the indication of the tell-tale over the lee-way card would give the correct lee-way in points of the compass.

I have named the main deck for the upper part of the machine, because it is only necessary to bring the tube sufficiently above the level of the water to prevent it flowing in: the shorter, therefore, it is above this point, the less liable will it be to injury from the rolling and working of the ship in gales of wind, for which allowance can be made in the width of the casing by which it should be protected.

It might be objected that by the insertion of the tube through the keel, it would tend to weaken that part; but it could be made of substance sufficient to answer the purpose of a copper bolt, and secured to the inner part of the keel by clamps, &c., or a flanch connected with the tube as at *n n*, thereby fixing it firmly and immovably in its intended place in the keel.

Further, it might be doubted whether, during a stiff breeze, and the consequent heel of the ship, the spindle, being thus diverted from its perpendicular position, would not be deprived of its free action to a degree likely to produce error in the indication of the lee-way, by the tell-

tale; but the effect of this position would be fully counteracted by the powerful action of the water on the water vane, which would ensure its communicating to the tell-tale the correct drift or lee-way of the ship.

In the experiments I have been enabled to make with the machine in a boat, it most completely answered my expectations; the position alluded to not in the slightest degree appearing to interfere with its free action.

N.B.—Mr. Bransfield, who has had considerable experience in the command of merchant ships, suggests that if fitted to them, he should recommend its passing through the ship's well, where it would not interfere with the cargo, and where the whole length of the tube could be got at, should accident by possibility render it necessary. I beg leave to adopt the suggestion both for men-of-war and merchant vessels.

JOHN HILLS, Lieut. R.N.

The following certificate accompanied Lieut. Hills' communication:—

Lancing,
5th August, 1839.

HAVING this day attended at a trial, made in a boat, of a machine invented by Lieut. Hills, R.N., for shewing the lee-way of a vessel, we are of opinion that it is a simple invention, by which the lee-way can be accurately ascertained.

W. HARGOOD, Captain R.N.
E. BRANSFIELD, Master R.N.